

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Thomas Holtzman Williams

Docket Number:

Serial Number: 10/697,393

Examiner: Jean B. Corrielus

Filed: 30 Oct 2003

Art Unit: 2611

Title: **Digital Transmission System Using Non-Orthogonal Matrices**

Commissioner for Patents

P.O. Box 1450

Alexandria, Virginia 22313-1450

RESPONSE TO OFFICE ACTION

Dear Sir:

Responsive to Office Action mailed Feb. 3, 2009 applicant respectfully submits this Response to Office Action

Amendments to the Specification begins on page 2 of this paper.

Amendments to the Claims begin on page 2 of this paper.

Amendments to the Drawings are the last pages of this paper.

Remarks begin on page 5 of this paper.

Amendments to the Specifications

1. Page 1, first full paragraph, line 3: “This patent application ~~is a continuation~~ claims priority of provisional US patent application 60/422308 filed on October 30, 2002.”
2. Page 4 line 10-11: “.that has been modified by dropping ~~rows~~ columns corresponding to corrupted terms in the received symbol sequence.”
3. Page 9, line 17: “Dropping the ~~row~~ column of the mother transmission matrix 304 that corresponds to the corrupt term in the truncated received symbol sequence creates the daughter matrix. If the 5th ~~row~~ column, corresponding to the 5th corrupt received term, is removed from the transmission matrix 304, a daughter transmission matrix with the corrupt ~~row~~ column removed 310 is created.”
4. Page 13, line 10 “At step 514 ~~the a~~ transmit symbol sequence is modulated and up-converted in frequency for transmission ~~with the transmit symbols sent sequentially in frequency.~~”
5. Page 13, lines 15-16: “At step 522 the data are converted from ~~time~~ frequency domain symbols into ~~frequency~~ time domain symbols.”
6. page 13, next to the last line: “If terms have been combined to reduce noise in the received symbol sequence, the corresponding ~~rows~~ columns are combined in the mother matrix to make a daughter matrix. “
7. Page 14, line 9: “Another improvement can be made to the block diagram of Fig5 Fig. 5 by using interleaving to provide additional protection from deep channel fades, which typically attenuate several adjacent frequency domain symbols.”

Amendments to the Claims

All prior claims are canceled. This listing of claims will replace all prior versions and listings of claims in the application. :

Listing of Claims

What I claim is:

1. (Canceled)
2. (Canceled)
3. (Canceled)
4. (Canceled)
5. (Canceled)
6. (Canceled)
7. (Canceled)
8. (Canceled)

9. (Currently Amended) A method for transmitting digital information in a data communication system comprising:

~~Comprising:~~

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- providing an input data sequence;
 - converting the input data sequence into an input symbol sequence;
 - multiplying the input symbol sequence by a non-orthogonal over-determined transmission matrix to produce a transmit symbol sequence;
 - modulating and up-converting the transmit symbol sequence using a modulator and up-converter;
 - transmitting the transmit symbol sequence in response to the modulating and up-converting;
 - receiving said transmit symbol sequence;
 - down-converting and demodulating said received symbol sequence;
 - excising corrupt symbols in the received symbol sequence in response to the down-converting and demodulating to produce a truncated received symbol sequence and ~~excised corrupt symbols~~;
 - creating an inverse recovery matrix based on said ~~excised corrupt symbols~~ and the transmission matrix;
 - multiplying the truncated received symbol sequence by the inverse recovery matrix to produce an output symbol sequence;
 - converting the output symbol sequence into an output data.

10. (Currently Amended) A method for transmitting digital information in a data communication system comprising:

~~Comprising:~~

providing an input data sequence;
converting the input data sequence into an input symbol sequence;
multiplying the input symbol sequence by a non-orthogonal over-determined matrix to produce an intermediate transmit symbol sequence;
converting the intermediate transmit symbol sequence with an inverse Fourier transformer to a transmit symbol sequence;
modulating and up-converting the transmit symbol sequence;
transmitting the transmit symbol sequence in response to the modulating
~~modulation~~ and up-converting;
receiving a received symbol sequence responsive to the transmitting;
down-converting and demodulating the received symbol sequence;
converting the received symbol sequence with a Fourier transformer to frequency domain symbols in response to the down-converting and demodulating;
excising corrupt symbols in the frequency domain symbols to produce truncated symbols;
creating a recovery matrix based on said ~~excised~~ corrupt symbols and over-determined matrix;
multiplying the ~~frequency domain~~ truncated symbols by the recovery matrix to produce an output symbol sequence;
converting the output symbol sequence into an output data, \pm

11. (Currently Amended) A method for transmitting digital information according to claim ~~2~~ 10 further comprising a step of adding a guard interval to said frequency domain symbols before the transmitting step.

12. (Currently Amended) A method for transmitting digital information according to claim ~~2~~ 10 further comprising a step of combining frequency domain symbols after the step of excising.

13. (New) A method for transmitting digital information according to claim 9 further comprising a step of inserting an identity matrix into said non-orthogonal over-determined transmission matrix.

14. (New) A method for transmitting digital information according to claim 9 wherein said inverse recovery matrix is a pseudo-inverse of the transmission matrix.

Remarks

Reconsideration is respectfully requested.

Claims 1-8 are canceled. Claims 9-14 are pending in this application. Claims 9 - 12 are currently amended. Claims 9 – 12 have been re-written to be method claims. Claims 13 and 14 are newly added.

Claim 13 is supported by text from page 14, line 15 to page 15, line 11.

Claim 14 is supported by text from page 11, line 9.

It is well known in the art that an IFFT is conventionally used at the transmitter to convert OFDM symbols before transmission, and that a FFT is used at the receiver to recover the transmission. However, it would function equally well to use a FFT at the transmitter and an IFFT at the receiver. It is well known in the art that a set of numbers that is operated on by an IFFT followed by a FFT is restored back to the original numbers. Likewise a set of numbers that is operated on by a FFT followed by and IFFT is also restored back to the original set of numbers.

The absence of additional patentability arguments should not be construed as either a disclaimer of such arguments or that such arguments are not believed to be meritorious.

Applicant believes no new material has been added.

Applicant believes the application to be in condition for allowance, and such action is earnestly requested.

Dated this 8th day of May, 2009.

Respectfully submitted:

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\Thomas H. Williams\